

# Claims

- [c1] 1.A camera actuator system comprising:
- a support block having a front face, rear face and two cable holes;
  - at least one camera support leg attached to and extending forward from said support block, said at least one camera support leg each having a rear end attached to said support block and a front end extending away from said support block;
  - a camera rotatably attached to said at least one camera support leg near said front end of said at least one camera support leg;
  - a front tilt pulley attached to said camera such that rotation of said front tilt pulley rotates said camera about said at least one camera support leg;
  - a motor;
  - a drive shaft having a rear end connected to said motor and a front end extending up into and through a shaft hole in said support block;
  - a stop collar attached to said front end of said drive shaft, said stop collar including a drive shaft stop;
  - at least one tilt stop attached to and extending forward of said front face of said support block, said at least one

tilt stop positioned on said support block such that said drive shaft stop contacts said at least one tilt stop;  
a rear tilt pulley mounted to said drive shaft below said rear face of said support block;  
a cable routed from said rear tilt pulley, through one of said cable holes of said support block, around said front tilt pulley, through an other of said cable holes of said support block and back to said rear tilt pulley, said cable fixed to said front and rear tilt pulleys;  
a mounting surface between said motor and said support block;  
a rear pan stop fixed to said mounting surface between said mounting surface and said support block;  
a front pan stop extending downward from said support block, said pan stop plate positioned to contact said rear pan stop at some point of rotation of said support block to stop rotation of said support block due to contact.

[c2] 2.The camera actuator system of claim 1, further including a friction device in said shaft hole of said support block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.

[c3] 3. The camera actuator system of claim 1, further including electronics to control said motor to rotate said

drive shaft, said electronics including override protectors to stop said motor when said electronics senses said at least one tilt stop is in contact with said drive shaft stop of said stop collar and when said front pan stop contacts said rear pan stop.

[c4] 4.The camera actuator system of claim 1, further including a ring gear mounted on said drive shaft between said mounting surface and said rear tilt pulley; wherein said ring gear is mounted in a fixed position to said rear face of said support block, such that said ring gear rotates with said support block; wherein said ring gear includes teeth with spaces between said teeth; and wherein said rear pan stop includes a movable stop arm which moves such that said movable stop arm can move in and out from said spaces between said teeth of said ring gear to engage and disengage said ring gear, whereby engagement of said ring gear with said moveable stop arm prevents rotation of said ring gear and said support block.

[c5] 5.The camera actuator system of claim 4, wherein said movable stop arm engages said front pan stop whether said moveable stop arm is engaged or not engaged with said ring gear, whereby said movable stop arm is large enough to allow such engagement of said front pan stop in either position.

- [c6] 6.The camera actuator system of claim 4, further including a solenoid to move said movable stop arm.
- [c7] 7.The camera actuator system of claim 4, further including at least one ring gear spacer between said ring gear and said support block to provide clearance between said ring gear and said rear tilt pulley.
- [c8] 8.The camera actuator system of claim 4, wherein said movable stop arm engages said front pan stop whether said moveable stop arm is engaged or not engaged with said ring gear, whereby said movable stop arm is large enough to allow such engagement of said front pan stop in either position; further including a solenoid to move said movable stop arm; and further including at least one ring gear spacer between said ring gear and said support block to provide clearance between said ring gear and said rear tilt pulley.
- [c9] 9.The camera actuator system of claim 4, further including a friction device in said shaft hole of said support block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.
- [c10] 10.The camera actuator system of claim 8, further in-

cluding a friction device in said shaft hole of said support block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.

- [c11] 11.A camera actuator system comprising:
- a support block having a front face and a rear face;
  - at least one camera support leg attached to and extending forward from said support block, said at least one camera support leg each having a rear end attached to said support block and a front end extending away from said support block;
  - a camera rotatably attached to said at least one camera support leg near said front end of said at least one camera support leg;
  - a front gear attached to said camera such that rotation of said front gear rotates said camera about said at least one camera support leg;
  - a motor;
  - a drive shaft having a rear end connected to said motor and a front end extending up into and through a shaft hole in said support block;
  - a stop collar attached to said front end of said drive shaft, said stop collar including a drive shaft stop;
  - at least one tilt stop attached to and extending forward

of said front face of said support block, said at least one tilt stop positioned on said support block such that said drive shaft stop contacts said at least one tilt stop;  
a rear gear mounted to said drive shaft below said rear face of said support block;  
a first middle gear attached to said support block which engages said rear gear;  
at least one additional middle gear attached to one of said camera support legs between said first middle gear and said front gear, said at least one additional middle gear engaging both said first middle gear and said front gear;  
a mounting surface between said motor and said support block;  
a rear pan stop fixed to said mounting surface between said mounting surface and said support block;  
a front pan stop extending downward from said support block, said pan stop plate positioned to contact said rear pan stop at some point of rotation of said support block to stop rotation of said support block due to contact.

[c12] 12.The camera actuator system of claim 11, wherein said first middle gear engages said rear gear at a ninety degree angle.

[c13] 13.The camera actuator system of claim 11, further including a friction device in said shaft hole of said sup-

port block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.

[c14] 14.The camera actuator system of claim 12, further including a friction device in said shaft hole of said support block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.

[c15] 15.A camera actuator system comprising:  
a support block having a front face and a rear face;  
at least one camera support leg attached to and extending forward from said support block, said at least one camera support leg each having a rear end attached to said support block and a front end extending away from said support block;  
a camera rotatably attached to said at least one camera support leg near said front end of said at least one camera support leg;  
a front gear attached to said camera such that rotation of said front gear rotates said camera about said at least one camera support leg;  
a motor;  
a drive shaft having a rear end connected to said motor

and a front end extending up into and through a shaft hole in said support block;

a stop collar attached to said front end of said drive shaft, said stop collar including a drive shaft stop;

at least one tilt stop attached to and extending forward of said front face of said support block, said at least one tilt stop positioned on said support block such that said drive shaft stop contacts said at least one tilt stop;

a rear gear mounted to said drive shaft below said rear face of said support block;

a gear shaft rotatably mounted to one of said camera support legs between said front and rear gears;

a first middle gear attached to said gear shaft which engages said rear gear;

a second middle gear attached to said gear shaft which engages said front gear;

a mounting surface between said motor and said support block;

a rear pan stop fixed to said mounting surface between said mounting surface and said support block;

a front pan stop extending downward from said support block, said pan stop plate positioned to contact said rear pan stop at some point of rotation of said support block to stop rotation of said support block due to contact.



second middle gear engages said front gear at a ninety degree angle.

[c17] 17. The camera actuator system of claim 15, further including a friction device in said shaft hole of said support block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.

[c18] 18. The camera actuator system of claim 16, further including a friction device in said shaft hole of said support block and about said drive shaft to cause rotation of said support block until said front pan stop contacts said rear pan stop, yet still allow rotation of said drive shaft to rotate said stop collar and said rear tilt pulley.

[c19] 19. The camera actuator system of claim 11, further including electronics to control said motor to rotate said drive shaft, said electronics including override protectors to stop said motor when said electronics senses said at least one tilt stop is in contact with said drive shaft stop of said stop collar and when said front pan stop contacts said rear pan stop.

[c20] 20. The camera actuator system of claim 15, further including electronics to control said motor to rotate said

drive shaft, said electronics including override protectors to stop said motor when said electronics senses said at least one tilt stop is in contact with said drive shaft stop of said stop collar and when said front pan stop contacts said rear pan stop.